Searching for pitch invariant representations in auditory cortex

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Pitch constancy relates to perceiving the same pitch from tones with differing spectral shapes and is one key criteria for identifying a pitch selective neural representation in auditory cortex. Here we used an event-related potential (ERP) adaptation study and a behavioural task (target same/different) to investigate whether pitch coding is invariant to changes in timbre. Adaptation is observed as a decrease in N100-P200 when the same stimulus is repeated because overlapping neuronal populations encode the stimulus. Reduced adaptation indicates that new neuronal populations are recruited to encode a change in an acoustic feature of interest (i.e. pitch, timbre or both). If neurons are selective to pitch (invariant to timbre), reduced adaptation should occur for pitch changes only. If selective to both (non-invariant to timbre), reduced adaptation should occur for pitch and timbre changes. Similarly, stimulus discrimination during the behavioural task should not require any additional processing resources if neurons are selective to pitch only, and hence reaction times and accuracy should be equivalent across conditions. If neurons are selective to both pitch and timbre, longer reaction times and poorer accuracy should be observed for timbre changes. We found reduced adaptation in the N100-P200 and increased reaction times and poorer accuracy for timbre changes. This suggests that neurons in auditory cortex are selective to both pitch and timbre, i.e. pitch coding is non-invariant to timbre. This supports recent evidence suggesting interdependence between pitch